

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:
a crystalline semiconductor film having a thickness between 5 and 40 nm, wherein:
a carbon concentration and a nitrogen concentration are 5×10^{18} atoms/cm³ or less, and an oxygen concentration is 1.5×10^{19} atoms/cm³ or less;
a main orientation plane is a {110} plane;
an absolute value of a rotation angle made by equivalent axes between adjacent crystal grains or by axes in rotation relation of 70.5° with respect to the equivalent axes is within 4°.
2. A semiconductor device according to claim 1, wherein the crystalline semiconductor film is a single crystal or substantially a single crystal.
3. A semiconductor device according to claim 1, wherein the crystalline semiconductor film comprises $\text{Si}_x\text{Ge}_{(1-x)}$ ($0 < x < 1$).
4. A semiconductor device according to claim 1, wherein the semiconductor device is at least one of a liquid crystal display device and an EL display device.
5. A semiconductor device according to claim 1, wherein the semiconductor device is at least one selected from the group consisting of a personal computer, a video camera, a goggle-type display, a digital camera, a player using a recording medium, a mobile computer, and a projector.
6. A semiconductor device comprising:
a crystalline semiconductor film having a thickness between 5 and 40 nm, wherein:
a carbon concentration and a nitrogen concentration are 1×10^{18}

atoms/cm³ or less, and an oxygen concentration is 5×10^{18} atoms/cm³ or less;
a main orientation plane is a {110} plane;
an absolute value of a rotation angle made by equivalent axes between adjacent crystal grains or by axes in rotation relation of 70.5° with respect to the equivalent axes is within 4°.

7. A semiconductor device according to claim 6, wherein the crystalline semiconductor film is a single crystal or substantially a single crystal.

8. A semiconductor device according to claim 6, wherein the crystalline semiconductor film comprises $\text{Si}_x\text{Ge}_{(1-x)}$ ($0 < x < 1$).

9. A semiconductor device according to claim 6, wherein the semiconductor device is at least one of a liquid crystal display device and an EL display device.

10. A semiconductor device according to claim 6, wherein the semiconductor device is at least one selected from the group consisting of a personal computer, a video camera, a goggle-type display, a digital camera, a player using a recording medium, a mobile computer, and a projector.

11. A semiconductor device including a circuit which is constituted by a thin film transistor having a semiconductor film as a channel formation region, wherein:

a carbon concentration and a nitrogen concentration are 5×10^{18} atoms/cm³ or less, and an oxygen concentration is 1.5×10^{19} atoms/cm³ or less;

a main orientation plane is a {110} plane;
an absolute value of a rotation angle made by equivalent axes between adjacent crystal grains or by axes in rotation relation of 70.5° with respect to the equivalent axes is within 4°.

12. A semiconductor device according to claim 11, wherein the crystalline semiconductor film is a single crystal or substantially a single crystal.

13. A semiconductor device according to claim 11, wherein the crystalline semiconductor film comprises $\text{Si}_x\text{Ge}_{(1-x)}$ ($0 < x < 1$).

14. A semiconductor device according to claim 11, wherein the semiconductor device is at least one of a liquid crystal display device and an EL display device.

15. A semiconductor device according to claim 11, wherein the semiconductor device is at least one selected from the group consisting of a personal computer, a video camera, a goggle-type display, a digital camera, a player using a recording medium, a mobile computer, and a projector.

16. A semiconductor device including a circuit which is constituted by a thin film transistor having a semiconductor film as a channel formation region, wherein:

a carbon concentration and a nitrogen concentration are 1×10^{18} atoms/cm³ or less, and an oxygen concentration is 5×10^{18} atoms/cm³ or less;

a main orientation plane is a {110} plane;

an absolute value of a rotation angle made by equivalent axes between adjacent crystal grains or by axes in rotation relation of 70.5° with respect to the equivalent axes is within 4°.

17. A semiconductor device according to claim 16, wherein the crystalline semiconductor film is a single crystal or substantially a single crystal.

18. A semiconductor device according to claim 16, wherein the crystalline semiconductor film comprises $\text{Si}_x\text{Ge}_{(1-x)}$ ($0 < x < 1$).

19. A semiconductor device according to claim 16, wherein the semiconductor device is at least one of a liquid crystal display device and an EL display device.

20. A semiconductor device according to claim 16, wherein the semiconductor device is at least one selected from the group consisting of a personal computer, a video camera, a goggle-type display, a digital camera, a player using a recording medium, a mobile computer, and a projector.